

REQUEST FOR RECONSIDERATION

Applicants wish to thank Examiner Fortuna for the courteous and informative discussion held with their U.S. representative on June 21, 2007. At that time, Applicants' U.S. representative reviewed and pointed out the chemical structural differences between the structures of the claimed invention and the reference materials cited as a basis for the obviousness rejection. The following is intended to expand upon the issues that were the basis of the discussion.

The claimed invention is directed to a method to produce a semipermeable membrane which exhibits improved stability in structural morphology and therefore provides improved reliability in permeability performance. The morphology of the membrane is critical to its performance and membranes are designed and prepared for specific utilities by control of the types of polymers and the relative proportions of those types employed to construct the membrane. Once this structure is constructed, permeability performance results and any subsequent change to the structure will alter the permeability character.

One method to design membranes for various types and degree of permeability performance is to construct a membrane comprising defined combinations of hydrophobic polymers and hydrophilic polymers. However, a problem encountered and one addressed by the claimed invention arises when hydrophilic polymers are washed from the membrane structure by aqueous solutions to which the membrane is exposed while performing the intended function. Due to such loss of hydrophilic component in the membrane, permeability character changes and stability of membrane performance is adversely affected.

The claimed invention, in general terms, addresses this problem relative to stabilizing a membrane structure morphology by chemically modifying the hydrophilic polymer component of a membrane to incorporate hydrophobic side chains such that the chemically modified hydrophilic polymers are not washed from the membrane. By employing such

hydrophobically modified hydrophilic copolymers, the membrane structure is stabilized and therefore permeability performance is also stabilized.

Claim 1 (please refer to Claim 1) describes the presently claimed method of the invention. The membrane is formed of copolymers comprising at least two types:

Copolymer A is a hydrophilic component comprising copolymers of a N-vinyl lactam and/or N-vinylamine. Copolymer A is chemically modified by including any of the monomers b1), b2), b3), b4) and b5). The inclusion of these monomers adds hydrophobic side chains to Copolymer A.

Copolymer B is a hydrophobic copolymer comprising the monomers as defined in Claim 1.

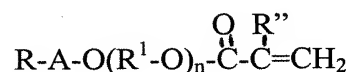
Maintaining a stable relative content of copolymer A and copolymer B in the membrane is accomplished according to the invention by stabilizing the copolymer A content to wash-out through the chemical modification with b1)-b5).

Applicants thank Examiner Fortuna for indication that Claims 13-14 and 18-19 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims. Allowance of the subject matter of Claims 13 and 14 recognizes the patentability of the claimed invention when copolymer A is modified with N-C₈-C₃₀-alkyl-substituted amides of monoethylenically unsaturated C₃-C₈ carboxylic acids; and N,N-C₈-C₃₀-dialkyl-substituted amides of monoethylenically unsaturated C₃-C₈ carboxylic acids.

The rejection of Claims 1-12, 15-17 and 20-21 under 35 U.S.C. 103(a) over Wilkinson (U.S. 5,942,120), Wilkinson in view of Meier et al. (U.S. 6,723,814) and Applicants admissions is respectfully traversed.

The cited references neither disclose nor suggest the method of Claim 1.

Wilkinson describes a composite microporous ultrafiltration membrane for the preparation of desalinated water. The membrane is therefore designed to provide pores which allow passage of water molecules and is constructed with a hydrophobic polymer and a water insoluble addition copolymer. The addition copolymer comprises an alkylphenoxy polyalkylene glycol acrylate having the following formula:



and a second comonomer selected from vinyl sulfonate acid salts, acrylamide N-substituted acrylamides, acrylonitrile, N-vinyl pyrrolidone, etc. and mixtures thereof. The paragraph beginning at line 53, Col. 4, of Wilkinson describes the structure and function of the polyoxyalkylene portion of the first comonomer:

“The membranes of the present invention have pores formed by long-chain polyoxyalkylene tentacles which are chemically joined to a carbon backbone having at least about 50 carbon atoms. The polyoxyalkylene tentacles contain about 20 to about 100 oxyalkylene units. **These units impart hydrophilicity to the pores** so as not to repel water molecules. . . .”

The hydrophilic character of the oxyalkylene chain can be gauged by the % oxygen content. For example when R¹ is ethylene the repeating unit would be $\text{-(CH}_2\text{CH}_2\text{-O)-}$ and the %O in the chain is 36% and when R¹ is propylene the repeating unit would be $\text{-(CH}_2\text{CH}_2\text{CH}_2\text{-O)-}$ and the %O is 28%. Clearly the side chain unit disclosed by Wilkinson to modify the water insoluble comonomer component of the ultrafiltration membrane is hydrophilic and is employed to assist the passage of water molecules through the membrane.

In contrast, the side chain structures of the monomers b1, b2, b3, b4 and b5 of the claimed invention are all C₈-C₃₀ alkyl and have **no oxygen component** as in the oxyalkylene unit of Wilkinson. Therefore by comparison the %O of the side chains of the claimed

invention is 0! **These side chains are clearly hydrophobic and very different from the Wilkinson unit.**

Therefore, Applicants respectfully submit that Wilkinson neither discloses nor suggests the claimed invention. Meier is cited to show hydrophobic side chain monomers with C₁-C₁₃ alkyl side chains. The Office seems to conclude that it would be obvious to replace the alkylphenoxy polyalkylene glycol acrylate of Wilkinson with the monomer of Meier to arrive at the b1-b5 monomers of the claimed invention and render the claimed invention obvious. However, as discussed above, Wilkinson requires a side chain with hydrophilic character as demonstrated herein by %O in the range of 20-40% and the alkyl side chains of Meier do not have this property. Therefore there would be no motivation to combine the teaching of Meier with Wilkinson and furthermore Applicants respectfully submit that Wilkinson actually teaches away from such a combination. As stated previously the hydrophilic side chain is important to allow water molecules to pass through the membrane. Hydrophobic side chains would not promote the passage of water molecules.

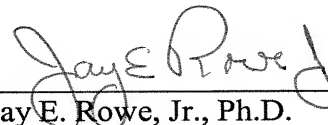
Based on the preceding arguments, Applicants respectfully submit that neither Wilkinson nor the combination of Wilkinson with Meier can anticipate or render obvious the claimed invention. Therefore, Applicants respectfully request that the rejection of Claims 1-12, 15-17 and 20-21 under 35 U.S.C. 103(a) over Wilkinson and Wilkinson in view of Meier et al. be withdrawn.

Application No. 10/507,362
Reply to Office Action of May 9, 2007

Applicants respectfully submit that all claims of the above-identified application are allowable and early notice thereof is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon



Jay E. Rowe, Jr., Ph.D.
Registration No. 58,948

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)